An Image Quality Wire-Grid Polarizing Beam Splitter

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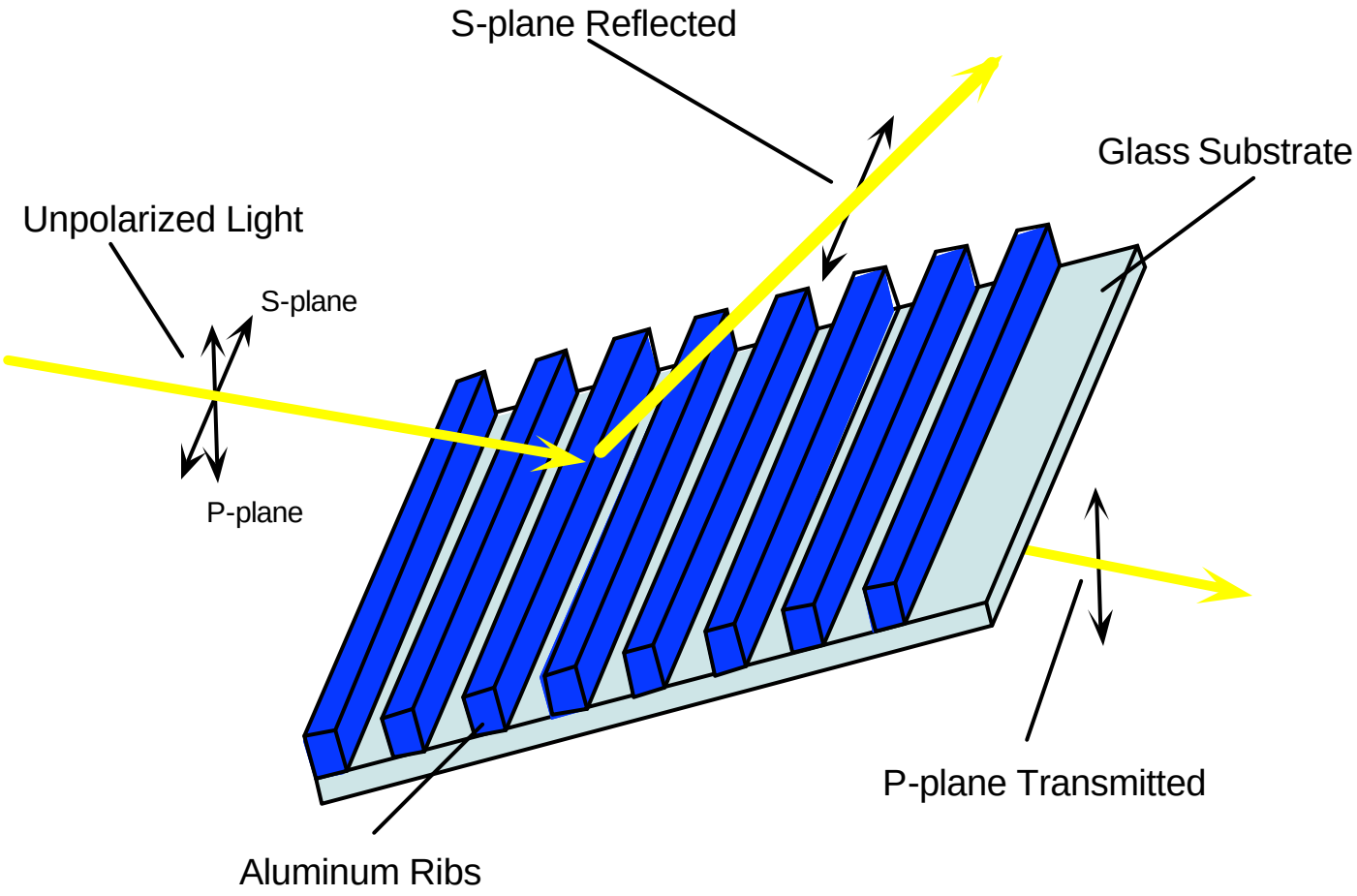
SID 2003 (7-01)

Wire-Grid Polarizer Function

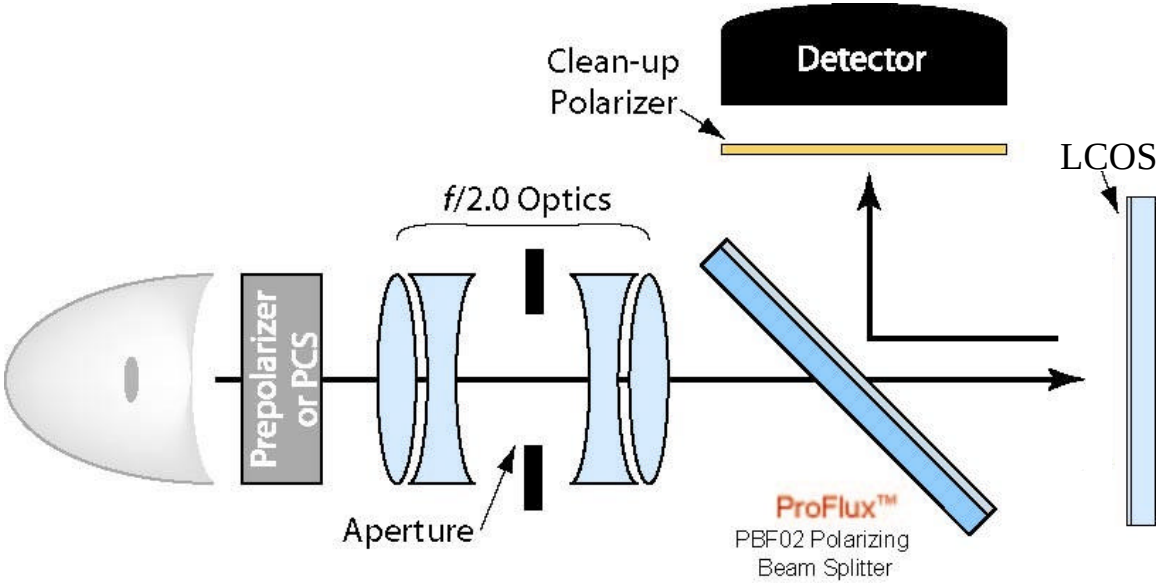


Wire-Grid Polarizer Distinctions

- **WGP vs. stretched film polarizer**
  - **Active region is 100nm vs. 100um**
  - **Polarizing region is extremely ordered**
- **WGP vs. thin-film cube polarizer**
  - **Polarization is relative to wire direction, independent of plane of incidence**

Test Configuration

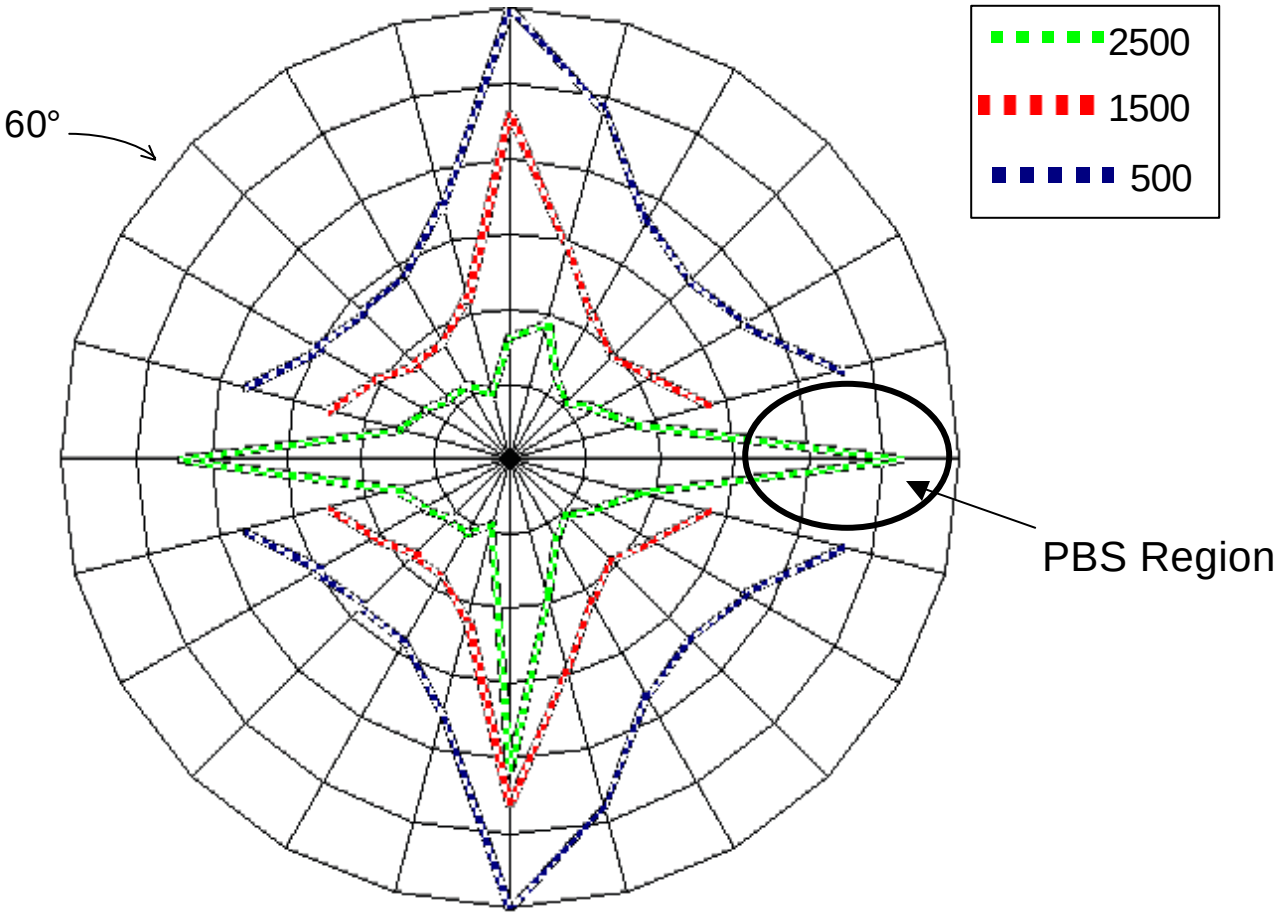
- **Contrast > 20,000:1 with mirror/QWP**
- **Contrast > 3,000:1 with LCOS panel**



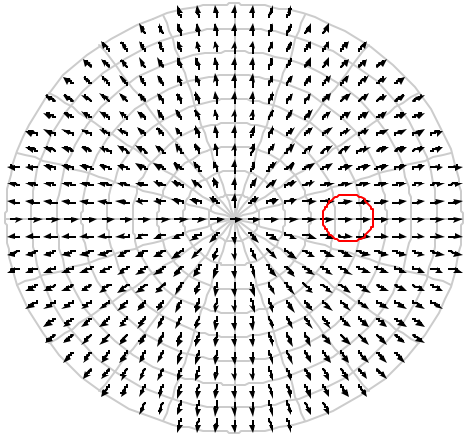
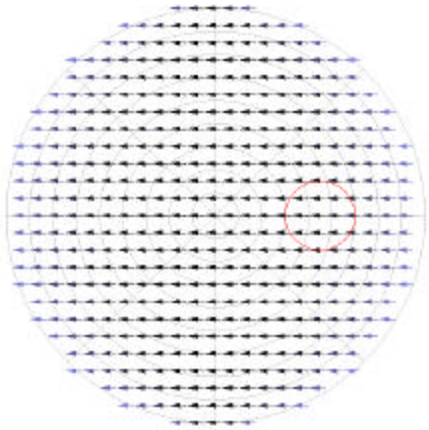
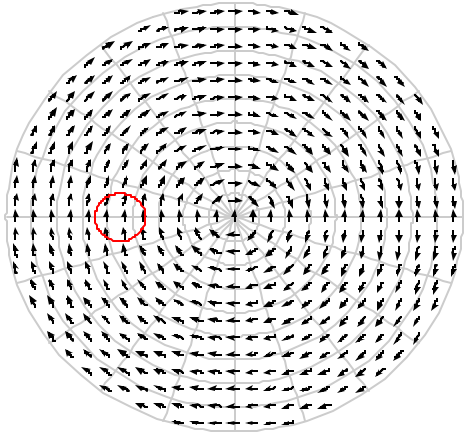
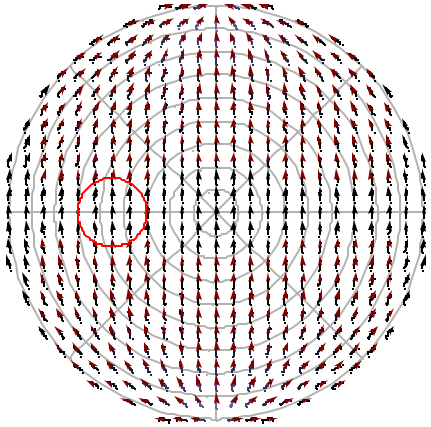
Understanding the Results

- **Why does the WGP enable such high contrast?**
- **Is the result easily repeatable?**
  - **Is it robust?**
- **What are the design implications?**
  - **The panel should look like a mirror.**

WGP Contrast (experimental)

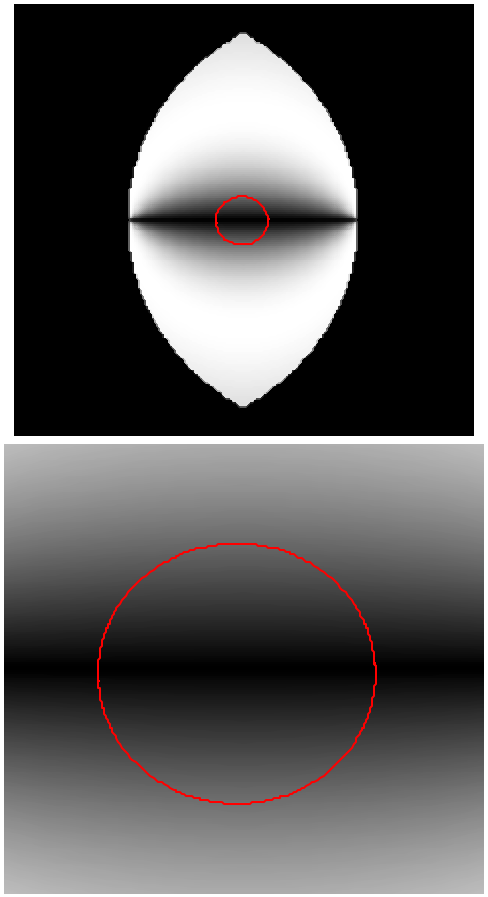


Polarization Orientation (ideal)

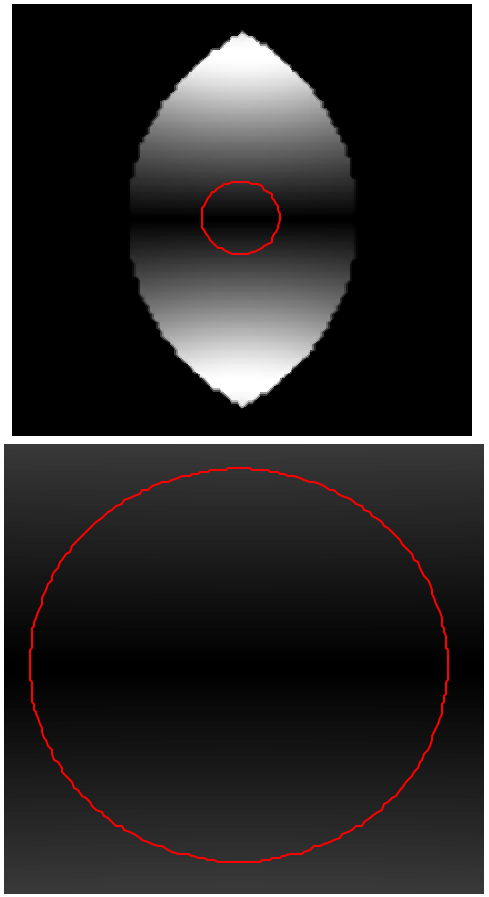
	Cube PBS	ProFlux™ PBS
Transmission		
Reflection		

PBS Maltese Cross

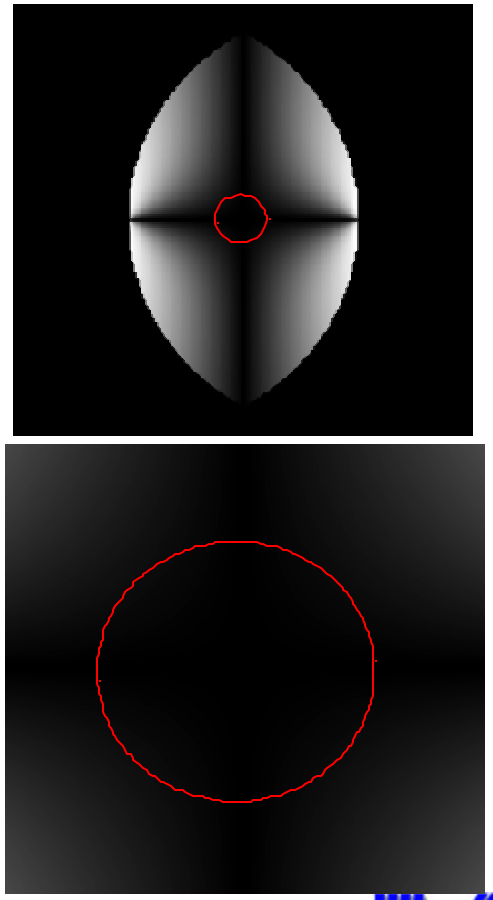
Cube PBS



ProFlux™ PBS

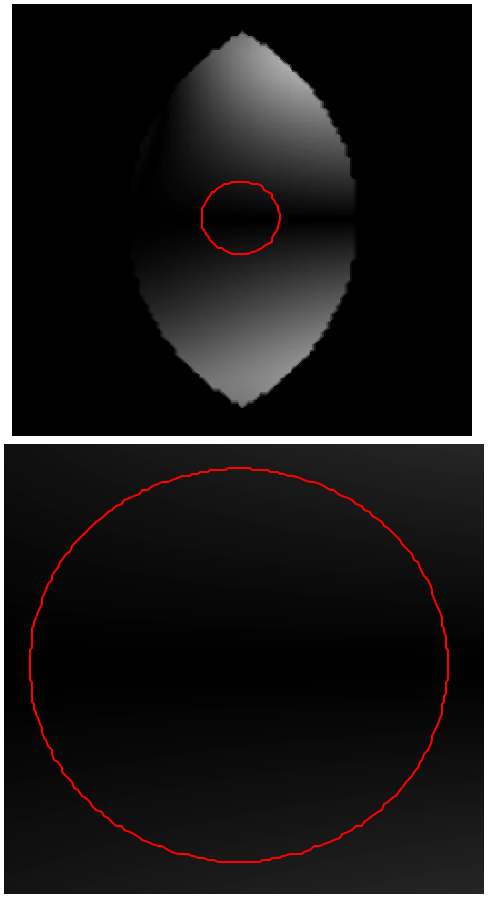


Cube PBS w/QWP

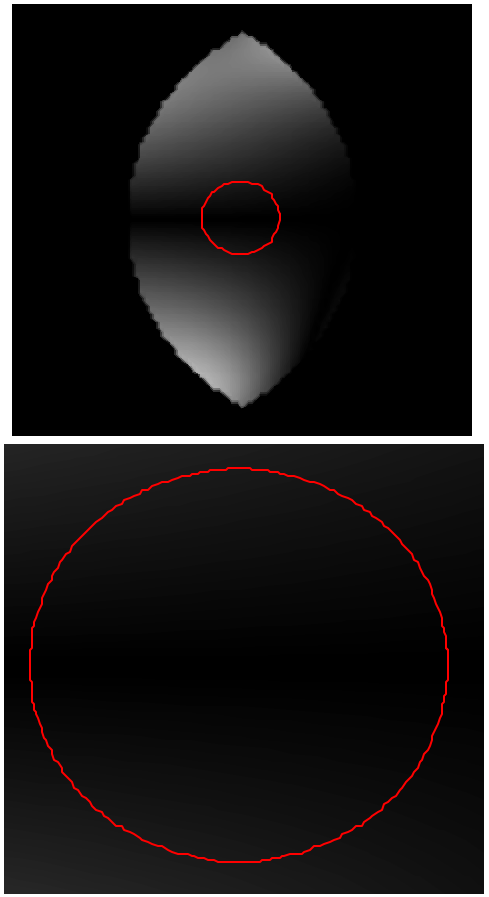


ProFlux™ PBS in a System

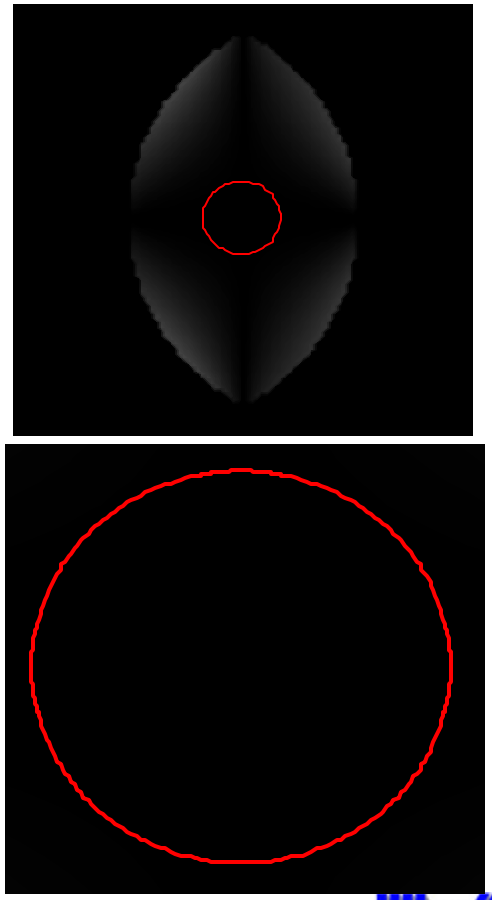
ProFlux™ PrePol



ProFlux™ Analyzer

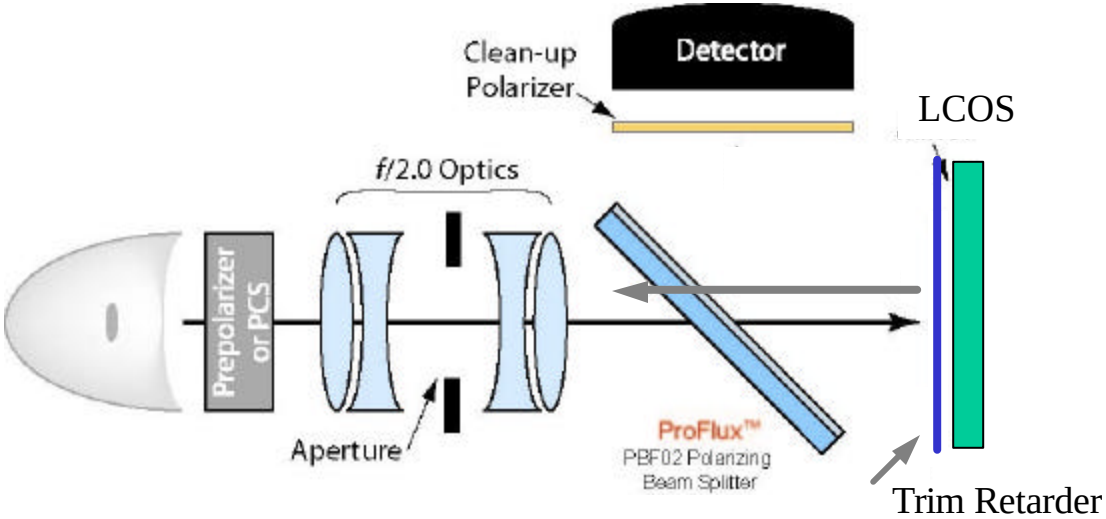


ProFlux™ in System



Test Configuration Revisited

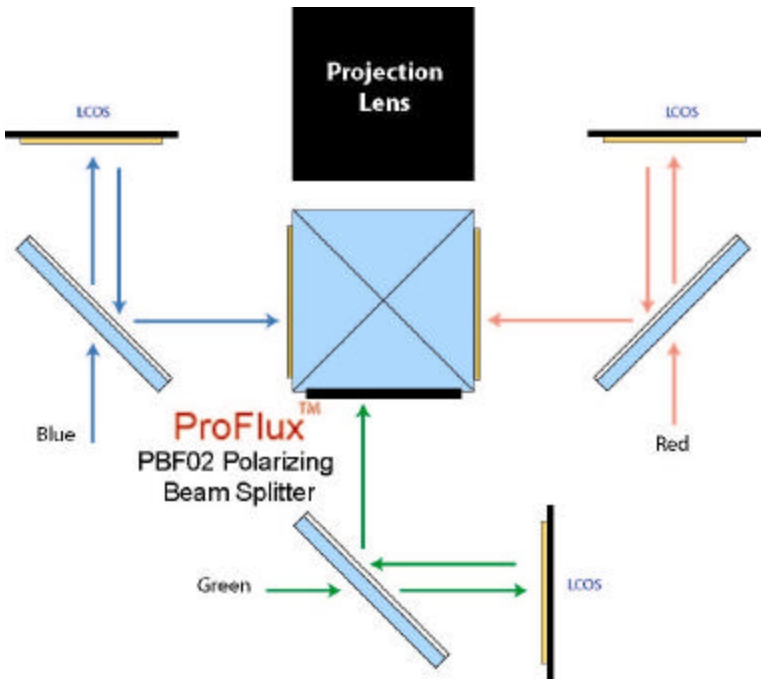
- **Contrast > 20,000:1 with mirror/QWP**
  - **Dark state has no QWP**
  - **Contrast is 2000:1 with QWP**
- **Contrast > 3,000:1 with LCOS panel**
  - **Dark state panel should function like a mirror**
  - **Use trim retarders to remove residual birefringence**



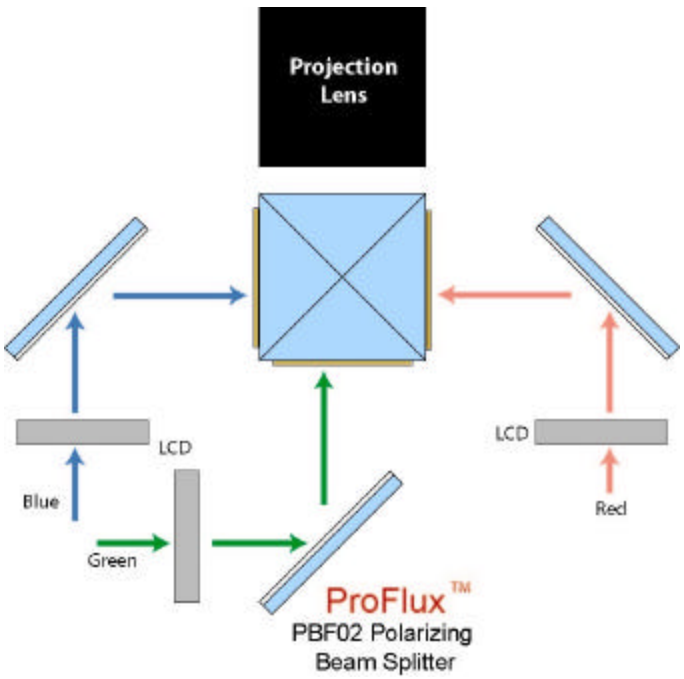
Summary

- **The optical design problem is simplified compared to cube architectures**
  - **Correct the panel to zero birefringence in the dark state**
  - **Panels previously considered unworthy have produced high contrast**

Applications



Reflective panels

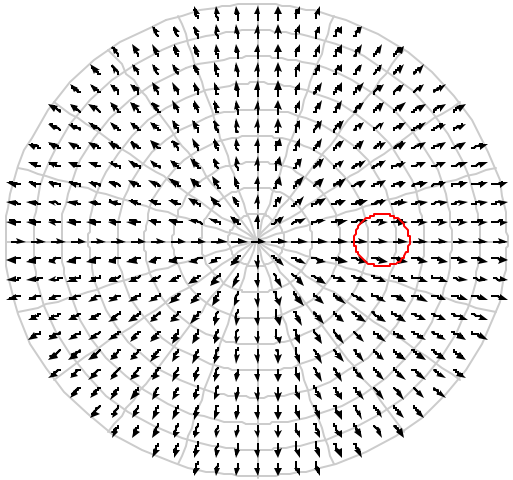


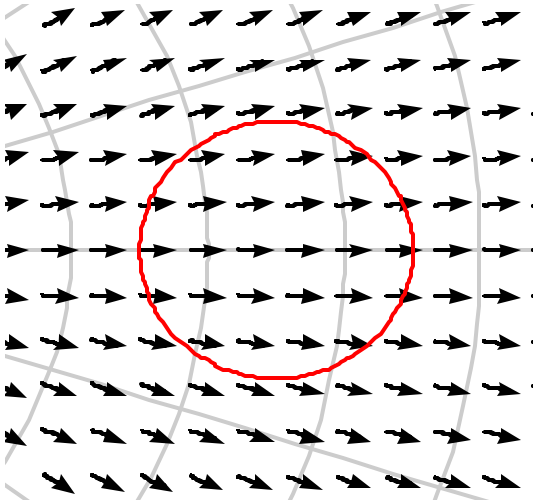
Transmissive panels

Thank You

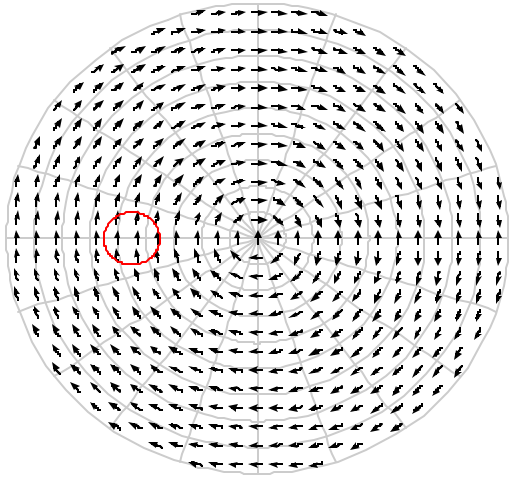
Cube Polarization Orientation(ideal)

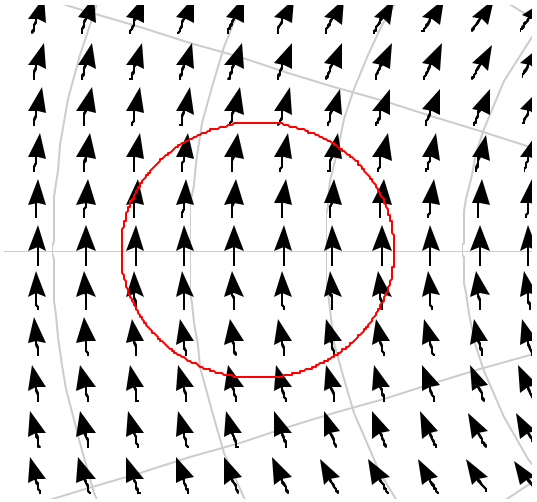
Transmission





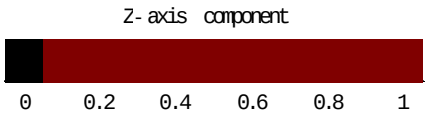
Reflection

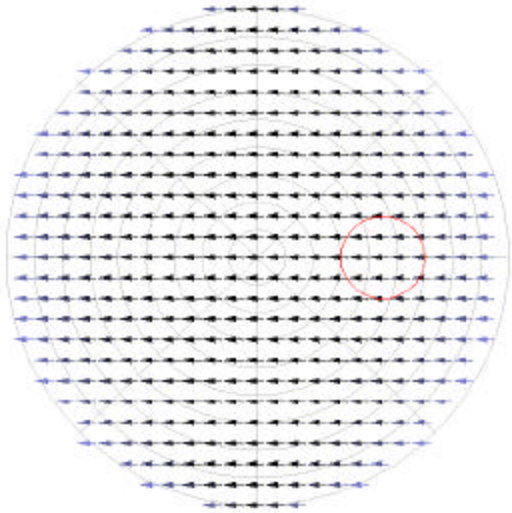


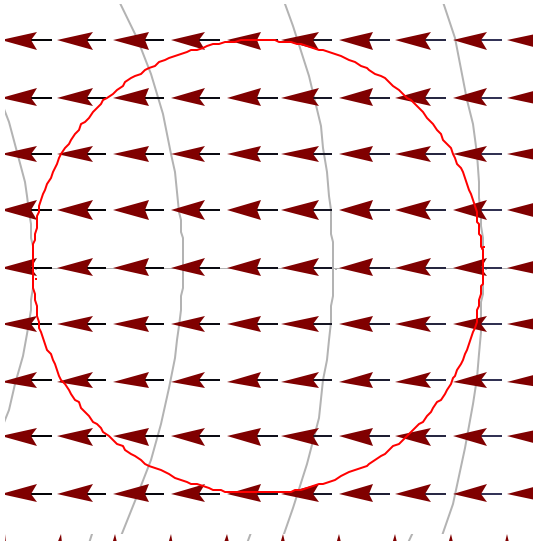


WGP Polarization Orientation (ideal)

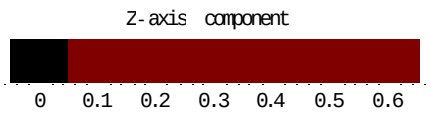
Transmission

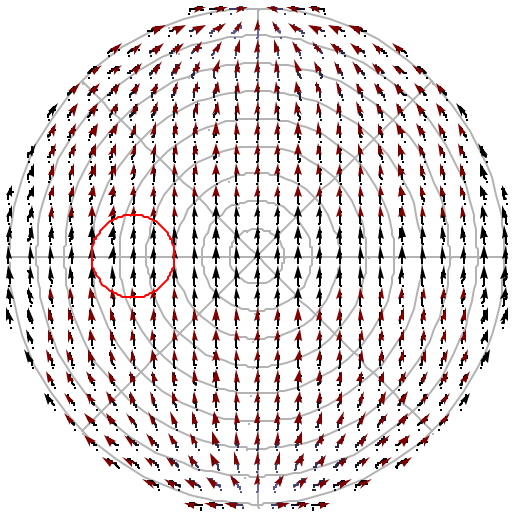


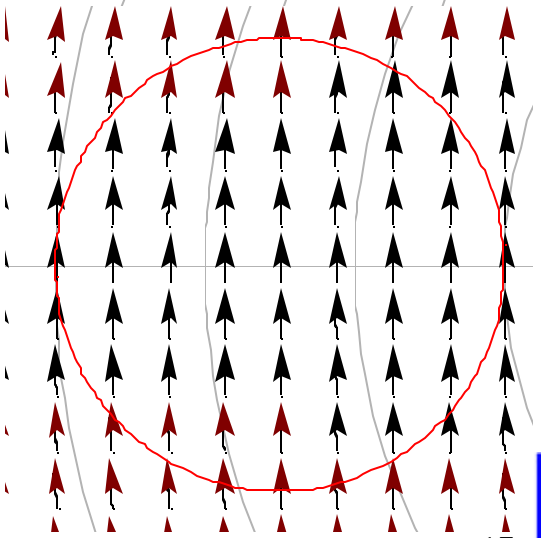




Reflection

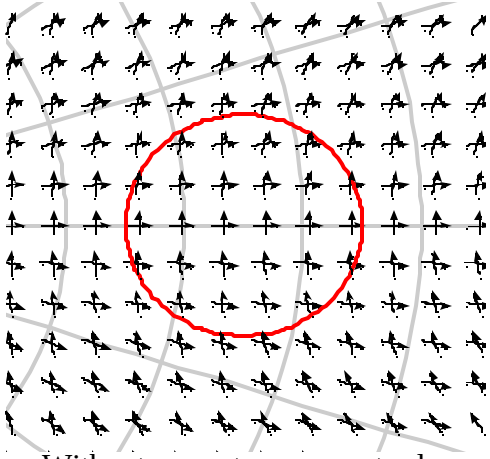




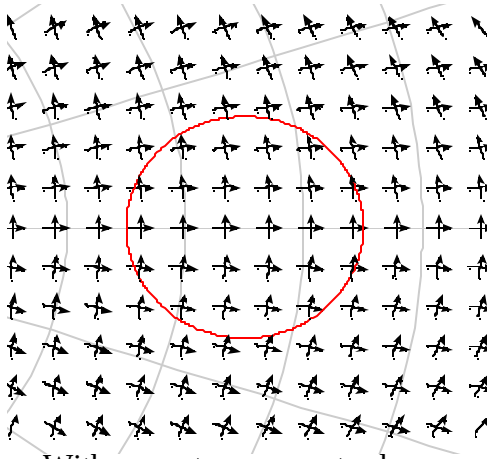


Polarization Ellipse Comparison

Cube

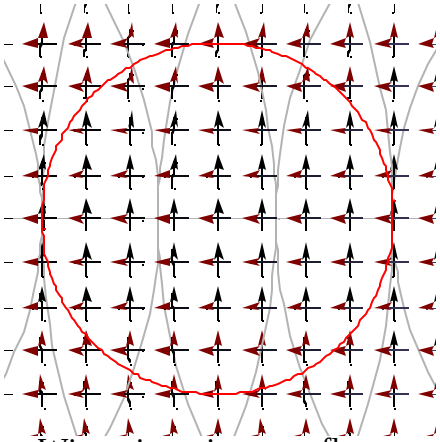


Without a quarter wave retarder

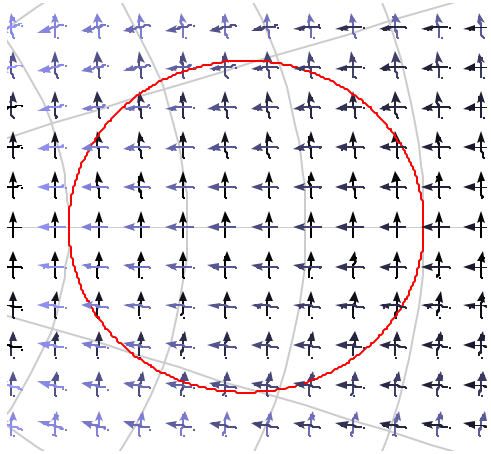


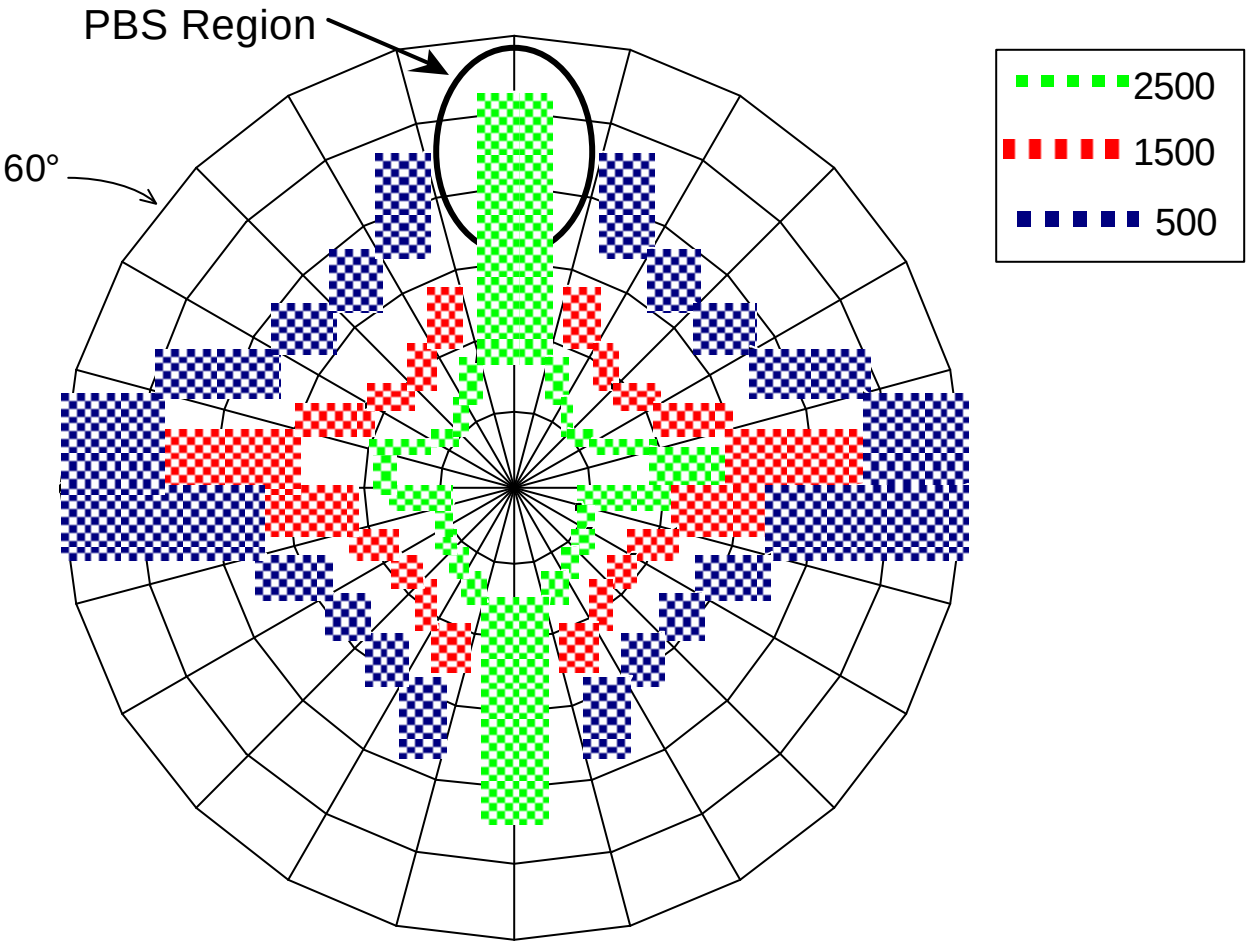
With a quarter wave retarder

WGP



Wire orientation: s- reflects



Wire orientation: p-reflects

WGP Contrast (experimental)